


	<u>BHARAT HEAVY ELECTRICAL LIMITED</u>		Indent No. : C/3991/7/3341/T Date:
	UNIT'S ADDRESS: HEEP, RANIPUR HARIDWAR - 249403 UTTARANCHAL, INDIA		Enquiry No. : Due Date :
			Supplier Qtn. No.: Date :
	<u>CONTACT PERSON FROM PURCHASE DEPTT.:</u> <u>NAME: MR. A.SANYAL</u> <u>DESIGNATION: SENIOR MANAGER (PPX-CAP)</u> <u>PHONE NO.: 0091 - 1334 - 285291</u> <u>E-MAIL: asanval@bhelhwr.co.in</u> <u>FAX NO. : 0091 - 1334 - 226462</u>		
<u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR CNC 5 AXIS TOOL & CUTTER GRINDER= Qty 3 Nos.</u>			
	NOTE :-		
	<p>1. Vendor must submit complete information against clause at Sl.No. 5.0 The offer, complying this clause, would only be considered.</p> <p>2. The vendor should fill the "Offered" Column in compliance to specified requirements and also "Deviations" Column, where there is deviation from the requirement. Duly filled specification cum compliance certificate should be submitted along with the offer. Inadequate, incomplete, ambiguous or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.</p> <p>3. The offer and all documents enclosed with offer should preferably be in English language only.</p>		
	ADDRESS OF THE SUPPLIER :	ADDRESS OF THE INDIAN AGENT(S) :	
	TELEPHONE NOS.:	TELEPHONE NOS.:	
	FAX NOS.:	FAX NOS.:	
	E-MAIL ADDRESS :	E-MAIL ADDRESS :	

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC 5 AXIS TOOL & CUTTER GRINDER WITH SPECIFICATIONS AS BELOW :					
No of Machines : 2 Nos.					
SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL				
	Universal tool grinding machine with 5 CNC Controlled axes is required for the production and resharpening of profile tools, various types of end mills. Step tools. Drills, step drills, Form cutters for Fir Tree Root of turbine rotor slot as well as Turbine Blade Root. All CNC -axes shall be driven by identical digital servomotors. Each motor shall be provided with encoder. All linear axis shall be equipped with direct path-measuring system (glass scales) of Heidenhain make or equivalent. Machine Base should be polymer concrete / cast Iron.				
1.1	Linear Axis				
a	Traverse Stroke X- axis (Longitudinal Side)	Vendor to intimate as per machine configuration			
b	Traverse Stroke Z-axis (Cross Side)				
c	Traverse Stroke y- axis (Vertical Slide)				
1.2	Max. Traverse Speed	15 m/min or more			
a	Control Resolution : Linear	0.0001 mm or better			
b	Control Resolution : Rotational Axis	0.0001 deg or better			
c	Max. Rotation C-axis(Rotary Table)	Vendor to intimate as per machine configuration.			
d	Max. Traverse Speed	20 RPM or more			
1.3	Work Head (A-axis)				
a	Speed (RPM)	600 or more			
b	Tool adoption	ISO 50			
c	Center Height With/ Without Over- table	Vendor to intimate as per machine configuration.			
1.4	Maximum Tool Dimensions :				
a	Complete grinding tool length	250 mm or more			
b	Tool Diameter (Max.)	235 mm or more			
c	Tool Diameter (Min.)	Vendor to intimate			
d	Weight of work piece	20 Kgs or more.			
1.5	Grinding head (C Axis)	Vendor to Confirm			
a	Nominal Drive motor Rating S1 (Continuous) and S6-60% (Peak Load) in KW	S1 Not less than 11.5 KW and S6 to be furnished.			
b	Grinding spindle(s) equipped with atleast 6 wheels or with tool changer to accommodate minimum 6 wheels along with following standard items:	Technical details to be furnished.			
c	Spindle diameter and taper	Vendor to intimate			

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d	Grinding enclosure with sliding and assembly doors with poly carbonate glazing and automatic door lock	Vendor to Confirm			
e	Lighting of internal working area with fluorescent lamp for illumination	Vendor to Confirm			
f	No.of Coolant valves and automatically controlled through grinding program.	Vendor to Confirm and furnish technical details.			
g	Probing system for positioning and measuring device for all geometrical parameters of tools.	Vendor to Confirm			
h	Machine integrated with appropriate Filtration facility, hose for cleaning the working area of machine. (Refer Point no 1.9 g for details).	Technical details to be furnished.			
i	Pneumatic clamping equipment with quick-change system for automatic clamping of tools with shank	Technical details to be furnished.			
j	Additional work table swiveling with C-axis, with 2 T-slots for mounting auxiliary equipment i.e. tail stock , steady rest etc.	Vendor to Confirm with details of T-slots			
k	Automatic central lubrication systems with onscreen prompt for re-filling and level indication.	Vendor to Confirm			
l	Percentage type spindle load meter.	Vendor to Confirm			
m	In cycle hour counter with reset facility.	Vendor to Confirm			
n	Compressed air point with manually operated on/off valve with sufficient length of flexible piping for piece cleaning.	Vendor to Confirm			
o	Metallic telescopic cover with wiper for all guide ways.	Vendor to Confirm			
p	Standard set of tools required for machine operation	Vendor to Confirm			
q	Safety covers for grinding wheels	Vendor to Confirm			
r	Grinding wheels adapters with detailed manufacturing drawings.	Vendor to confirm and furnish details of adapters.			
1.6	CNC Control.	Technical details to be furnished			
a	Operating Panel:	Technical details to be furnished			
b	PC EQUIPMENT :				
c	Pentium IV processor 512 MB RAM or highest rating at the time of submission of the offer , PCI bus operating system WINDOWS NT Interface. Touch screen monitor is preferable.	Vendor to Confirm and furnish details.			
d	Hard disk of 80 GB (easily replaceable) or of highest rating available at the time of submission of offer.	Vendor to Confirm			
e	Interface: serial (COM 1/2) , parallel (LPT1) & 2 nos RS-232C and for PC key Board and Printer , USB port	Vendor to Confirm			

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f	Programs based on MS-DOS can be run supplied with machine.	Vendor to Confirm			
g	Colour monitor 15 inches, CD ROM 32 speed , SCSI- Interface, 3.5 inch floppy drive	Vendor to Confirm			
h	IQMEGA ZIP Drive for automatic back up controllable by the operator panel.	Vendor to Confirm			
i	Pen Drive / USB Memory Data stick (2 Nos) of reputed make. Capacity = 1 GB.	Vendor to Confirm			
j	Interface protocol Interbus S	Vendor to Confirm			
k	Separate input/output modules	Vendor to Confirm			
l	CFC free Air-conditioning unit integrated in the control cabinet & Electrical Panel	Vendor to Confirm			
m	Uninterrupted Power Supply (UPS) Device of atleast 15 mins duration of reputed make.	Vendor to Confirm. Details to be furnished.			
n	When switching off the machine or when sudden power interruption occurred, the UPS device will give a message to operating system. All open files then are closed automatically and Windows NT will be closed in correct sequenced. During this period, the UPS device will be supplying power to be control. UPS will also protect the control against power spikes and power fluctuation.	Vendor to Confirm			
i	Normal Voltage (for UPS)	220-240 V			
ii	Voltage range of power supply (for UPS)	-27%to +18% of nominal voltage			
iii	Frequency (for UPS)	50-60 Hz			
iv	Battery standby time (for UPS)	15 minutes or more			
1.7	OPERATING CONDITION:				
	415V + 10% / -10%, 50HZ +/-3 HZ, 3 Phase AC (3 wire system without neutral) Power Supply Voltage will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers, Voltage Stabilizer, Isolation Transformer, Control Panel etc. required for connecting BHEL's power supply point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to Confirm			
	Total machine including all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Ambient Conditions: Temperature up to 30 degree Celsius in Air Conditioned Hall Relative Humidity About 70%	Vendor to Confirm			

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1.8	Tele diagnostic Service:				
a	Tele-diagnostic service should be provided through International telephone lines along with required Hardware / Software for the supplied CNC system to access both CNC and PLC. This should be provided free of charge for the guarantee period. Terms and conditions for the service after guarantee period should be informed by vendor. Help guide should be provided for use of the system/service.The same is to be demonstrated during commissioning of the Machine (Refer point no 1.24)	Vendor to confirm			
1.9	Following items shall also form part of scope of supply :				
a	Manual actuation of tailstock for mounting.	Vendor to confirm			
b	Additional center for tailstock	Vendor to confirm			
c	Air filter and air drier unit along with pneumatic valve for regulation air supply	Vendor to confirm			
d	Single lamp with three colours displaying operational status of the machine and visible from distance.	Vendor to confirm			
e	Foot Switch assembly, using the foot switch , the chuck can be automatically opened and closed	Vendor to confirm			
f	First Filling of Oils & Lubricants: First filling of all required Oils , lubricants, & Grease etc. for the machine and auxiliary system to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.The vendor shall also submit estimated annual consumption of all these items on 7000 hours per year working basis.	Vendor to confirm and provide the necessary details			
g	Coolant Filtration System: Edge type coolant filtration unit (KNOLL make or equivalent) comprising of coolant tank, filter drum (made of high quality steel mesh), vacuum pump, coolant pump, flushing pump, oil separator etc.shall be offered as part of basic machine. The Technical details including make , model to be furnished with the offer.	Vendor to confirm and intimate: make , model no.and its technical details. Vendor to confirm filtration size should be 3 microns of less.			
h	Mist/Flue Gas Extraction System : Machine shall have Mist Extraction System/ Flue Gas Extraction System such as Electro Suction Filter unit including all connection and installation at convenient location.	Vendor to confirm and intimate: make , model no.and its technical details.			
i	Sutiable provision for Dressing of CBN/ Diamond grinding wheel.	Vendor to confirm and furnish technical details.			
j	Electrical Control Cabinet & Operator's Pendant shall be fitted with proper cooling arrangement for working in a centralized air-conditioned hall having temperature up to 30 degree Celsius.Electrical cabinet shall be provided with a 220V, 5 Amp socket for maintenance purpose.	Vendor to confirm			

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k	One set of special maintenance/ calibration tools for geometrical accuracy tests including calibration mandrel, granite block, cylinder dial gauges, Fluke multimeter and other special tools as required for service and maintenance of the machine shall be offered. Also, tools required for accuracy tests after replacement of spindle.	Vendor to confirm			
1.10	Measuring and setting gauge :	Vendor to confirm			
1.11	Tools package:				
a	Pull stud for tools or chucks = 1 each (if applicable)	Vendor to confirm			
b	Collet Clamping 6-32 mm with clamping chuck = 1 each	Vendor to confirm and indicate the Diameters			
c	Work Holding arbor dia- 10, 13,16,22,27,32,40,50 mm with key slots inorder to facilitate proper clamping of cutters (Length to be indicated)- 1 each	Vendor to confirm and indicate length.			
d	Reduction Sleeve ISO 50 / Spindle taper to MT1, MT2,MT3,MT4,MT5 - 1 each	Vendor to confirm			
e	Hydraulic Expansion Chuck SK 50 clamping dia 6- 32 mm - 1 each	Vendor to confirm			
f	Collets for Hyd Expansion chuck dia 6,8,10,12,14,16,18,20, 25 & 32 - 1 each	Vendor to confirm			
g	Detailed manufacturing drawings of Pull studs, Arbors, technical specifications/ catalogues of clamping chucks , collets & reduction sleeves shall be supplied.	Vendor to confirm			
h	Detailed specification of all these items are to be supplied within 6 months in the event of ordering.	Vendor to confirm			
i	Tool Holding Options : To include Pneumatic actuators , Clamping units Options 45 and 30 degree , Assembly 2-27 mm, Collet adaptors 40 mm , Collets upto 40 mm	Vendor to confirm			
j	Tool Measurement:				
	Provision of checking/ measuring detailed geometry of tools specially profile milling cutters prior to and after resharpening (including cutters Drawing no A,B,C,D,E and F) for Flute depth , clearances , rake angle , helix, flute postioning etc.	Vendor to confirm and furnish technical details.			
k	Automatic calibration of all Axes and automatic diagonistic solutions.	Vendor to confirm and furnish technical details.			
l	All applicable grinding wheels (CBN & Diamond) - 4 Nos each	Vendor to confirm and furnish technical details.The offer should be item wise.			
1.12	Software Packages :				
a	End Mills of Type : Square End , Corner Radius , Ball Nose - Flute Gashing, Constant Helix Ball nose. End Mills can be Parallel or tapered with Lead and Constant Helix. All Grinding Operations : Spiral Tool or Shear Plane . It should be capable to accommodate Right / Left hand Cutting ; Right / Left Hand Fluted- All 4 Combinations.	Vendor to confirm			

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b	Manufacturing and Resharpener Cycles : All types of Fluting (Fluting form solid, Flute Polishing, Raised land fluting.), OD (Radial relief OD finishing, Parallel OD) and End face (End face, Heel Clearance, Endface notching, Chamfer grinding)	Vendor to confirm			
c	Digitizing Cycles : End of Tool , Lead , Radial Flute index position , Flute Length , Flute depth , Lead , Helix angle , Multiple digitizing , Auto-tool measurement , Coolant hole digitizing of drill points , Flat ends and OD.	Vendor to confirm			
d	Wheel Compensation Cycles : based on the data entry of the measured Land width , OD , Gash Depth , Web Thickness.	Vendor to confirm			
e	Universal Step Tool Software : All grinding operations on the spiral tool and shear plane. Software capable to several elements which consists of either of straight lines and radii.	Vendor to confirm			
f	Projector Fluting software: To simulate the grinding on the screen before actual grinding. Onscreen measurements such as distance and angle.This should also include Flute shape and end face geometry, Wheel interference can be recognised. Tool Cross section in the Longitudinal axis can be displayed at defined distance from end of the tool, On-screen measurements such as distance and angle. This should include Fir Tree Root cutters (as per Drawings enclosed at Annexure- A, B ,E,F) The same is to be demonstrated during commissioning.	Vendor to confirm			
g	Profile Software : Software suiting to grinding wide variety of defined tool of any profile shape containing just lines and arcs. This should include Form cutters for Turbine rotor slot as well as Turbine blade root - Fir Tree root. The offered software interface should be capable of creating the tool profile or by using CAD/ DXF software. The profile data are then converted using line and arc segments into grinding path. The same is to be demonstrated during commissioning.	Vendor to confirm			
h	Side and face Cutter: The same is to be demonstrated during commissioning.	Vendor to confirm			
i	Single setup waveform grinding and resharpener (OD only) for carbide and HSS tools, for left and right hand cut tools from solid blank. Can be used to grind square and corner radius endmill as well as ballnose.(all four combinations)	Vendor to confirm			
j	Full and true 3D simulation of the grinding process. Viewing of the grinding process and the resulting model. On-screen tool model measurements. Identification of possible collision or process feasibility prior to the actual grinding. The same is to be demonstrated during commissioning.	Vendor to confirm			
k	3D Simulation for interactive design of customized flute profiles in the manufacturing process.	Vendor to confirm			
l	Standard data or software packages of the Vendor data base system.	Vendor to confirm and indicate the standard software offered.			
1.13	MACHINE MONITORING SYSTEM(MMS) SIGNALS				
	Following MMS signals would be made available on a specifically earmarked terminal strip . These MMS signals would be sourced from a SIMATIC S-7 PLC output card separately.	Vendor to confirm			
a	➤ Cycle ON				
b	➤ Spindle running				
c	➤ Feed Active - Any of the axes running				
d	➤ M30 Program Stop.				

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1.14	SIGNALS FOR AREA MANAGER SYSTEM				
	The PLC on each machine shall have one additional 24 Input, 24 Output card for tapping of signals for Area Manager System. These inputs & outputs should be left unprogrammed for use with the Area Manager System	Vendor to confirm			
1.15	FAULT DIAGNOSTIC SYSTEM				
a	TELE DIAGNOSTIC SERVICE	Vendor to offer			
	Tele-diagnostic service/ Remote Diagnosis should be provided through International analog telephone lines along with required Hardware / Software for the supplied CNC system to access both CNC and PLC. This service should be provided free of charge for the guarantee period.	Vendor to offer			
b	FAULT DIAGNOSTIC SYSTEM				
i	Supplier's own diagnostic system with required Software and Hardware installed on the CNC system, which shows detailed cause and remedy for the fault on the CNC system display with full video diagnostics indicating the element /device causing the fault. Vendor should also offer a PC note book (2 Nos.) along with software required for communicating PLC (licensed copy), necessary communication cables, PCMCIA card / Adaptor (for Communication with MPI port) for diagnostic purpose. The Note Book PCs should be loaded with complete Electrical Schemes, Mechanical Assembly drawings, Hydraulic Circuit Diagrams, Operation and Maintenance Manuals, Machine Alarm list along with Help text wiring diagram, On-Line display of PLC user should be available on the note book PC.	Vendor to offer and submit details.			
ii	Provision of OEM Screen with soft keys enabling the service personnel to bring back the tool carriers of the ATC/WPC to its initial/nearest position in case of interruption of tool carrier's positioning cycle due to alarm on the machine or power failure. With this OEM screen, service personnel should be able to perform individual steps of Tool carriers positioning cycle manually. Separate Hand Held Pendant should also be provided to retrieve the tool carrier to its initial position.	Vendor to offer			
iii	Machine should have provision to switchover from position feedback system -2 (direct) to Position feed back system-1 (Motor encoder) through PLC program (for service personnel only).	Vendor to offer			
iv	Help guide should be provided to use both diagnostic systems shall be provided.	Vendor to offer			
1.16	SERVO VOLTAGE STABILIZER				
a	Oil / Air Cooled Servo Controlled Voltage Stabilizer (of reputed Indian make) suitable for complete machine, its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
b	Make	NEEL, Aplab or Auto Electric			
c	Model, Rating & Input/ Output Voltage etc.	Vendor to inform			
d	Monitoring device with cutoff facility for under/over output voltage, Devices for load current measurement, MCCB at input for overload/short circuit protection. (Details to be submitted)	Vendor to inform			
e	Spares Package for Servo Voltage Stabilizer, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years of trouble free operation considering three shifts continuous running of the machine.	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.17	ULTRA ISOLATION TRANSFORMER				
a	Ultra Isolation Transformer (of reputed Indian make) suitable for complete machine , its drives, controls, PLC etc. for unbalanced load & supply conditions considering specified power supply & ambient conditions.	Vendor to offer			
b	Make	NEEL, Aplab or Auto Electric			
c	Model, Rating & Input/Output Voltage etc.	Vendor to inform			
d	Monitoring device with cutoff facility for under/over output voltage, Devices for load current measurement, MCCB at input for overload/short circuit protection. (Details to be submitted)	Vendor to inform			
e	Catalogue of the Isolation Transformer shall be submitted with the offer.	Vendor to submit			
1.18	SPARES:				
1.18.1	Mechanical, Hydraulic, Electrical and Electronic spares used on the machine, with item-wise breakup, are to be recommended and offered by the vendor in sufficient quantity for 2 years trouble free operation of the complete machine including CNC system and its accessories considering three shifts continuous running of the machine. Detailed list is to be submitted. Price of unit quantity of each item is to be quoted. The offered package should include items mentioned below, in addition to other recommended spares.				
a	CNC & Electrical spares:				
b	Hard Disc loaded with necessary software.	Vendor to offer.			
c	Operator panel and Display Monitor - 1 No each	Vendor to offer			
d	Diskette unit with connecting cable- 1 No.	Vendor to offer			
e	PLC input and output cards- 1 No. each type (Digital, fast I/O & analogue)	Vendor to offer			
f	Machine Control Panel- 1No.	Vendor to offer			
g	Power Modules for all axis - 1 No. each	Vendor to offer			
h	Heidenhain Transducer (Scanning Head) for X-axis, Y-axis, Z-axis, Heidenhain encoder for the table - 1 No. each	Vendor to offer			
i	Profibus control components- 1 No. each type if applicable.	Vendor to offer			
j	Drive Control Card - 1 No. each type	Vendor to offer			
k	Filter and Choke Module- 1 No.	Vendor to offer			
l	External PLC CPU if used in the machine- 1 No.	Vendor to offer			
m	Following spare parts shall be offered as essential spares for the machine				
n	All proximity switches used in the machine- 2 Nos each type	Vendor to offer			
o	Set of Push Buttons- 2 Nos each type	Vendor to offer			
p	Set of Indicating Lamp- 30 Nos each type	Vendor to offer			

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q	Set of Contactors- 1 NO. EACH TYPE	Vendor to offer			
r	Set of Overloads/ Automats- 1 No. each type	Vendor to offer			
s	Machine Status Indicating Lamp (Complete unit) - 2 Nos	Vendor to offer			
t	Spares Package for Tool Monitoring System	Vendor to offer			
u	Spares Package for all Accessories	Vendor to offer			
v	COMPLETE CONTROL SYSTEM LOADED WITH NECESSARY SOFTWARE AND ADD ON CARDS ETC.	Vendor (to confirm)			
w	Complete Spindle Drive Controller	Vendor (to confirm)			
x	Axis Drive Controller card	Vendor (to confirm)			
(i)	All types of spares for total machine and accessories should be available for atleast ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required.	Vendor (to confirm)			
(ii)	Repair service contract with supplier of CNC system for service & spares for motor drives, CNC Unit and Milling Spindle should also be offered by the vendor.	Vendor to offer			
(iii)	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine.	Vendor (to confirm)			
(iv)	Mechanical & Hydraulic Spares: * All types/varieties of pumps used on machines i.e.Hydraulic, lubrication, coolant and oil cooling pumps (1 no. each type) * All types of D.C. Control valves (2 no. each type) * All types of flow control, pressure regulators, pressure reducer valves, coolant gun, Nozzles used on m/c. (1 no. each type) * All types of pressure switches, flow switches and float switches (2no. each type) * All types of Pressure Gauges (1No. each type) * All types pf filter inserts (4 nos. each of regenerative type & 20 nos. each of disposal type) * Shaft seals (2 nos. each type) * O-Rings and Piston rings (5nos. of each type) * Accumulator with charging kit if the same is used in the m/c (1 no each type) * All types of pneumatic valves (1 no. of each type), Pressure regulators (1 no each type), Moisture Seperator (1 no each type), Pressure gauges (1 no each type) * All types of Hydraulic Hoses (1 no. of each type), pneumatic hoses (1 no each type) * Spare Spindle - 1 No	Vendor to offer			

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	* Bearings (1 set for each machine) * All types of Belts (2 Nos. each type) * Flexible Bellow Cover (1 No. each type) * Special Oil/ Grease/ Cooling Agent (if any)- Sufficient qty. for 1 year (operation on 3 shift basis) * Hydro Motor (1 No. each type) * Coiled Flexible air/coolant pipes (2 Nos. each type)	Vendor to offer			
(v)	Additionally the vendor shall recommend essential spare package for 2 years 3 shift trouble free working of the machine with detailed list along with item wise price in commercial offer, specification and source of supply.				
(vi)	All the spares should be offered individually priced.				
1.19	DOCUMENTS:				
a	4 hard copies of all programming (Basic and Advance), Cycles, Tool management etc. and all operational manuals shall be supplied in English language.	Vendor to confirm			
b	Following manuals/diagrams/ list/ specifications shall be supplied in English language along with the machine documentation:	Vendor to confirm			
c	Basic Machine operation and maintenance/ service manual - 4 copies	Vendor to confirm			
d	Programing manual of PLCs.	Vendor to confirm			
e	Circuit diagram of auxiliary systems/ equipment	Vendor to confirm			
f	CNC Systems documentation comprising Operator's Guide, Programming Guide, Dignoistic Guide, Planning Guide, Description of Functions, Drive Functions, Installation Guide Lists, Planning Guide of Motors.	Vendor to confirm			
g	Service manuals of all bought-out items such as Heidenhain devices, safety devices etc. used in the machine.	Vendor to confirm			
h	Manufacturer's documantation such as electrical schematic of all machine, PLC Programe listing (hard copy as well as 3.5 inch Floppy disc) with clearly defined comments in English. Machine documentation should also include complete listing of all electrical and mechanical parts used in the machine with their parts numbers and order numbers.	Vendor to confirm			
i	Complete Operating and Programing guide and User's manual of PC Based software for variety of cutter resharpening and manufacturing. The backup of all the software shall be supplied on CD ROM.	Vendor to confirm			
j	Electrical schematic of the machine- 4 copies	Vendor to confirm			
k	PLC print-out in Operand form with comments in English- 4 copies	Vendor to confirm			
l	GHOST back up of hard disk and on CD	Vendor to confirm			
m	Complete list of parts used in the machine along with specification, part/ ordering numbers and address of manufacturer in case of purchased item- 4 copies.	Vendor to confirm			
n	Detailed assembly drawing with clear marking of each component and giving reference of manufacturer of each assembly/sub-assembly- 4 copies.	Vendor to confirm			
o	Hydraulic, Pneumatic, Lubrication and Coolant circuit diagram along with part list, complete specification and make of each element used – 4 copies.	Vendor to confirm			

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p	Wiring diagram indicating lay out of cables, plugs, junction boxes, terminal strips etc.- 4 sets	Vendor to confirm			
q	List of all bearings, L.M. guides, ball bushings etc. with full specification and make.- 4 sets.	Vendor to confirm			
r	Alarm list and fault diagnostic manual- 4 sets	Vendor to confirm			
s	Spare part list along with specification, part number and address of manufacturers- 4 sets.	Vendor to confirm			
t	Service and user manuals of all bought out items- 4 sets.	Vendor to confirm			
u	Help guides for tele-diagnostic service systems- 4 sets	Vendor to confirm			
v	All necessary fault diagnostic manuals as indicated at point no 1.15	Vendor to confirm			
w	For all the above documents one soft copy on CD wherever possible be provided.	Vendor to confirm and intimate documentation in CD Clause no wise (1.19 a to y)			
x	Assembly Drawings of the Spindle	Vendor to confirm			
y	One Set of all the documents in best available condition shall be supplied one month prior to commencement of training of BHEL Engineers	Vendor to confirm			
1.20	ACCURACY TESTS	Vendor to confirm			
a	Geometrical Accuracy Tests shall be in accordance with relevant & prevailing international standards viz. ISO 1708 or equivalent applicable standard. Detailed Test Charts for the same, clearly showing the accuracies to be achieved on the machine, shall also be submitted with the offer.	Vendor to confirm and indicate the tests to be carried			
b	All the Geometrical accuracies including test pieces machining if any etc. should be demonstrated to BHEL engineers during pre-acceptance at Supplier's works. The repeat test of the geometrical accuracies shall also be demonstrated at BHEL Hardwar, the same shall have to be arranged by the vendor. Test pieces are to be supplied by vendor. Drawings of test pieces to be submitted with the offer.	Vendor to confirm and indicate the details.			
c	Submit test chart for all accuracies as per DIN 8609/ ISO 10791 standard or equivalent applicable standard.	Vendor to confirm			
e	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at supplier's works and during erection & commissioning at BHEL works.	Vendor to confirm			
f	MACHINE POSITIONING ACCURACIES & REPEATABILITY: Should be measured as per VDI/DGQ 3441 (Latest Revision) using LASER INTERFEROMETER.	Vendor to confirm			
g	Positioning accuracy in X /Y/Z axis (Pa) per 1000 mm	Vendor to inform			
h	Positioning accuracy in A & C axis	Vendor to inform			
i	Repeatability in X / Y /Z axis (Ps)	Vendor to inform			
j	Repeatability in A& C axis	Vendor to inform			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.21	MACHINE FOUNDATION:				
a	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) or Purchase Order, whichever is earlier. Complete Foundation Design including details viz. static / dynamic load details etc. and final layout drawings shall be submitted by the supplier within three months after getting BHEL's approval for Preliminary layout Drgs. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air dryer & all other accessories/offered items. The vendor shall provide an optimised layout of the offered machines. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to confirm			
b	Foundation Bolts: leveling elements and other items required for erection of the machines shall be supplied along with machine packages.	Vendor to confirm			
c	Soil condition at BHEL, Haridwar is mentioned below : (a) Soil strata : Silty sand up to 2.5 meter depth (b) Average density of soil = 1.8 T/m ³ (c) Angle of internal friction = 35° (up to 3.0 m depth) (d) Coefficient of elastic uniform compression "Cu" = 3.0 Kg/cm ³ - (at 7m depth for 10m ² base area and 1.0 Kg/cm ² confining pressure) (e) Bearing capacity at 1.5 meter depth = 10T/m ² (f) Water table = 25 meter below ground level	Vendor to confirm			
1.22	TRAINING:				
a	BHEL persons should be trained at vendor's works for a mutually agreed period in the area of :	Vendor to confirm			
b	Programming	Vendor to confirm			
c	Operation	Vendor to confirm			
d	Mechanical , hydraulic & Pneumatic maintenance	Vendor to confirm			
e	Electrical and electronics maintenance.	Vendor to confirm			
f	Electronic Maintenance engineer shall be given additional one week training at the works of CNC Control manufacturer HMC.	Vendor to confirm			
g	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm			
h	Competent, English speaking experts shall be arranged by the vendor for satisfactory & effective training of BHEL personnel.	Vendor to confirm			
i	Vendor to provide training charges (if any) on Pro-rata basis in the commercial offer.	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.23	Machine Pre-acceptance (at Supplier's worker) : During pre acceptance all geometrical functions tests in accordance with DIN standard are to be witnessed by BHEL representative. Further mutually agreed types of tools covering use of all type of software shall be ground in the presence of BHEL Trainees for with the supplier shall arrange material. Prior to despatch of the machine, clearance for dispatch to be obtained from BHEL.				
1.24	ERECTION & COMMISSIONING				
a	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment/accessories, machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. In proposed shop where machines are to be installed, EOT Crane of Capacity 5 Ton will be available. In case crane of higher capacity is required, vendor to arrange the same by hiring mobile crane from local sources Other requirements like helping personnel etc shall be provided by BHEL. Details of these requirements should be informed/discussed by vendor and agreed with BHEL in advance. Compressed air pressure available in the shop is 5.0 Kg/Cm ² . If the required compressed air pressure for operating of the machine is more than the stated pressure , the vendor to quote suitable compressor (of Indian make preferable) as an optional item.	Vendor to confirm & offer			
b	Erection & Commissioning of Voltage stabilizer, Isolation Transformer , Air Dryer and other accessories with all electrical & mechanical connections shall also be responsibility of the vendor.	Vendor to offer			
c	Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at Sl. No. 1.19, 1.22 and testing/demonstration of tele-diagnostic service shall also be part of the commissioning activity.	Vendor to confirm			
d	Tools, Tackels, Test Mandrels, instruments and other necessary equipment (including Laser equipment, if required) required to carry out all erection & commissioning activities should be arranged and brought by the supplier.	Vendor to confirm			
e	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm			
f	Broad Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to submit			
g	Charges, duration, terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	Vendor to offer			
h	Portion, if any, of the machine, accessories and other supplied items where paint got rubbed or peeled off during transit or erection should be repainted and matched with the original adjoining paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colours/shades of paints used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to confirm			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.25	PROVE OUT OF BHEL COMPONENTS				
a	Complete and successful machining of proveout component, to the specified design accuracy and surface finish, shall be done by the vendor after erection & startup of the machine at BHEL works using tools, equipment and CNC programs etc. supplied by the vendor. Representative of vendor shall have to re-sharpen about 20 nos mutually agreed types of cutters (to be finalised during technical discussion) for demonstration of all software, machine capability, consistency and repeatability (This will include cutters drgs nos A, B, C, D, E, D, F..... (6 Nos) Additionally Vendor shall supervise one full week of work on the machine after completion of commissioning and job proving.	Vendor to confirm & offer. This should including checking of cutters.			
b	Vendor shall be fully responsible for Re-sharpening of cutters as well as manufacture cutters from Blank as per drawing accuracies and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and got cleared by vendor during initial technical discussions.	Vendor to accept & confirm.			
c	Vendor shall be responsible for any deviation/rejection in proveout component due to wrong re-sharpening or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc. Any change in tooling during proveout shall be at the responsibility and cost of the vendor. The vendor shall supply the toolings changed at proveout stage as per quantity mentioned under the heading of 'Tooling Package' at point no 1.11	Vendor to accept & confirm.			
1.26	FINAL MACHINE ACCEPTANCE				
a	Final acceptance shall be made by BHEL Hardwar after completion of following activities:				
b	Demonstration of specified/offered Geometrical accuracies as per test chart/standard after machine commissioning.	Vendor to accept & confirm.			
c	Demonstration of specified/offered Positioning accuracies as per VDI-DGQ/3441 and specified values after machine commissioning	Vendor to accept & confirm.			
d	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine including point no 1.12 (a to l) along with demonstration of Machine networking as indicated at point no 1.80a	Vendor to accept & confirm.			
e	Training of BHEL machine operators in operation of complete machine, software & accessories etc by the supplier's experts / engineers during their stay at BHEL works.	Vendor to accept & confirm.			
f	Prove out of BHEL components as per contract agreement.	Vendor to accept & confirm.			
1.27	GUARANTEE				
	Guarantee for complete machine,CNC Control, softwares and all supplied accessories/equipments for 24 months from the date of final acceptance of the machine. Any spare required during guarantee period shall have to be arranged by the vendor free of cost and duty levied have to be borne by the vendor.	Vendor to confirm & offer			

SL. NO.	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION	REMARKS
1.28	Fortnightly Bar Chart : Vendor will provide fortnightly bar chart indicating progress of manufacture of machine tool. Vendor to provide digital pictures of progress of the machine manufacture on monthly basis, in the event of order.	Vendor to accept & confirm.			
1.29	Quality Plan : Vendor shall submit Quality Plan within three months from the data of ordering.	Vendor to accept & confirm.			
1.30	TROPICALISATION				
a	All electrical / electronic equipment shall be tropicalized.	Vendor to accept & confirm.			
b	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to accept & confirm.			
c	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to accept & confirm.			
d	All electrical / electronic panels to be provided with adequate door locks. All electrical & electronic panels including operator's panel should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical adapters/receptacles, fittings, consumables etc. should be compatible with Indian equivalents.	Vendor to accept & confirm.			
e	All motors shall conform to IEC or Indian Standards	Vendor to accept & confirm.			
f	All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays/chains etc. required for laying of cables should be included in the offer.	Vendor to accept & confirm.			
g	Vendor should ensure the proper earthing for the machine and its peripherals/accessories. Any material requirement for the same should be informed with foundation design/drawings. The vendor can take earthing connection from the nearest available location of the production shop.	Vendor to accept & confirm.			
1.31	SAFETY ARRANGEMENTS				
a	The design of the machine will be such as to provide utmost operational safety. Mechanical and Electrical stoppers, electronic interlocks should be provided to ensure coordinated functioning and to prevent damage to various elements of the machine. Adequate safety interlocks to be provided for auto Pallet Changing cycles if available / offered. Headstock, Spindle, Guide ways etc. to protect against fall in oil level, overloads or fall in compressed air pressure.	Vendor to confirm.			
b	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.	Vendor to confirm.			
c	A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm.			

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d	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to confirm.			
e	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to confirm.			
f	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to confirm.			
g	Oil & water pipe lines should not run with electrical cable in the same tray/trench.	Vendor to confirm.			
1.32	ENVIRONMENTAL PERFORMANCE OF THE MACHINE				
a		Vendor to confirm.			
b	Maximum noise level shall be 85 dB (A) at 1 meter away from the machine with correction factor for background noise, if necessary. This will be measured as per international standards like DIN 45635-16. Supplier to demonstrate compliance to noise level, if asked for.	Vendor to confirm.			
c	There shall not be any emissions from the machine. All fumes etc. during machining shall be arrested by Fume extraction system mentioned at point 1.9 h	Vendor to confirm.			
d	There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm.			
e	No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm.			
f	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm.			
g	Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.	Vendor to confirm.			
1.33	COLOUR OF THE MACHINE:				
	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm.			
2	PACKING:				
	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm.			
3	ADDITIONAL INFORMATION				
a	Following information shall be supplied with the offer:				
b	Machine Model No.	Vendor to inform			
c	Work Area (Height of centre), maxm. Diameter and length of cutters that can be accomodated.				
d	Total connected load (KVA)	Vendor to inform			

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e	Space required (Length, Width, Height) for complete machine & accessories	Vendor to inform			
f	Catalogue of the machine	Vendor to submit			
g	Total weight of the machine	Vendor to inform			
h	Weight of heaviest part of machine	Vendor to inform			
i	Weight of the heaviest assembly of the Machine	Vendor to inform			
j	Dimensions of largest part of the machine	Vendor to inform			
k	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, Spindle power, Load Capacity, Max job Envelope, CNC System.	Vendor to inform			
l	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Vendor to confirm			
m	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential. All the pipes required for the same shall be included in the standard scope of the machine.	Vendor to confirm			
n	Final acceptance shall be made at customer's works following successful erection & commissioning and achieving geometrical accuracy of the machine as well as successful prove out of components and supervision for two full weeks of continuous production on the machine.	Vendor to confirm			
4	GENERAL INFORMATION				
	All the information and drawings attached with tender document are exclusive property of BHEL Hardwar. Under no circumstances these should be passed to any third party without prior permission of BHEL and must not be used directly or indirectly detrimental to the interest of BHEL.	Vendor to accept & confirm.			
5.0	QUALIFYING CONDITIONS				
a	Only those vendors (OEMs) , who have supplied & commissioned at least one no. 5 Axis Tool & Cutter Grinder of same or higher sizes with respect to Spindle power and offered machine parameters at point no 1.2, 1.3, 1.4, 1.5a and 1.12(a to k) in the past ten years (on the date of opening of Tender) and referred machine is presently working satisfactorily for more than one year (on the date of opening of Tender) after commissioning, should quote. However, if referred machine has/had been supplied to BHEL, then the machine should be presently working satisfactorily for more than six months (on the date of opening of Tender) after its commissioning and acceptance in BHEL. The following information should be submitted by the vendor about the companies where referred machine have been supplied . This is required from all the vendors for qualification of their offer.	Vendor to accept & confirm.			
b	Name of the customer / company, where referred machine is installed.	Vendor to inform			
c	Complete postal address of the customer.	Vendor to inform			
d	Month & Year of Commissioning .	Vendor to inform			
e	Parametres of machine(s) supplied and Application for which the machine has been supplied.	Vendor to inform			

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f	Name and designation of the contact person of the customer.	Vendor to inform			
g	Phone no., FAX no. and email address of the contact person of the customer.	Vendor to inform			
h	Performance certificate from the customers regarding satisfactory performance of machine supplied to them (Original Certificate or through E-mail directly from the customer). The original certificate may be returned after verification by BHEL.if required	Vendor to submit			
i	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to accept & confirm			